# Report for 2002NY7B: Development of Methods to Distinguish Between Ruminant and Human Sources of Fecal Contamination in Watersheds

There are no reported publications resulting from this project.

Report Follows:

**Problem & Research Objectives:**

In order to reduce fecal contamination of water bodies, watershed managers first need to identify the sources of the contamination. Traditionally, results of fecal coliform and fecal streptococcus testing have been used. Since these groups are found in both humans and other mammals, watershed managers look to the ratio of fecal coliform to fecal streptococcus as a possible indicator of the source of contamination. Unfortunately, this is not a reliable approach for several reasons (APHA, 1998).

The objectives of the project are:

1)To assess the effectiveness of the Bacteroides PCR test, coprostanol, and caffeine at identifying sources of fecal contamination in watersheds;

2)To compare the sensitivity of the Bacteroides PCR test, coprostanol, and caffeine with more established indicators of fecal contamination (total coliforms, fecal coliforms, E. coli, fecal streptococcus, enterococcus) under different seasonal and land use conditions;

3)To conduct a preliminary evaluation of the effect of agricultural best management practices on water quality downstream of farms in Albany and Rensselaer Counties.

The project will focus on the collection and analysis of samples collected from several stream stations in Albany and Rensselaer Counties.

**Methodology:**

For this project, we propose to assess the ability of a new, molecular-based PCR method to identify sources of fecal contamination in watersheds. This method identifies fecal contamination through the amplification of *Bacteroides* DNA. This method, while being able to identify the presence of fecal contamination, is exceptional due to its ability to quickly and efficiently identify the source of contamination as being human or ruminant.

**Principal Findings & Significance:**

Investigators worked closely with representatives from the Albany and Rensselaer County Soil and Water Conservation Districts to identify stream stations that would be used for the study. In the cases where streams were located downstream of farms, the farmers were consulted and their approval was obtained before a station was selected for the study.

The specific locations of the stations that are being used for this study are blind, both in terms of when results are reported, and for the investigators when they perform the laboratory analyses. Instead of their specific identity, stations are assigned alpha-numeric labels and categorized by their upstream land use.

The first round of sampling was collected in July 2002 over four days. The samples collected were considered representative of summer, low flow conditions. Samples from the second sampling, conducted in November, were considered representative of moderate flow conditions. Twelve stations were sampled, with triplicate samples collected at each station. The breakdown of sampling stations is as follows:

- Three stations downstream of CAFOs with no BMPs in place

- Two stations downstream of CAFOs with BMPs in place
- Three stations draining a combination of farms and residential areas with septic systems
- Three stations downstream of septic systems considered failing or poorly sited
- One station downstream of forested land with neither farms nor residences upstream

The July and November samples have been analyzed for all of the parameters, although investigators are still in the process of analyzing for species-specific *Bacteroides*. The winter sampling is scheduled to take place as soon as conditions allow.

Statistical analysis of results has not been conducted yet, so findings reported here are general observations of the data rather than results of robust statistical analyses. A summary of results on the basis of analytical data available to date is as follows:

- *Bacteroides*, caffeine, and coprostanol were detected in many of the samples collected
- Triplicate samples used for microbiological analyses collected at the same stations seem consistent with one another
- Total coliforms were high in all of the samples, regardless of station location, including the "pristine" control
- Fairly high numbers of *E. coli*, fecal streptococci, enterococci, and fecal coliforms were found in all but the pristine site's samples
- There is not an apparent relationship between land use upstream and fecal coliform/fecal streptococcus ratio

**Notable Achievements:**

Excellence in Research Award,  University at Albany, School of Public Health, for poster describing this research.